REMARKS

This is a reply to the Office Action dated April 12, 2005. Claims 1-36 are pending in the above-referenced patent application. Claims 2-13, 17-22 and 25-33 were objected to but were deemed allowable if rewritten in independent form including all of the limitations of base claims and any intervening claims. Claim 36 was allowed. Applicant wishes to thank the Examiner for detailing the allowed and allowable claims.

Claims 1, 14-16, 23, 24, 34 and 35 were rejected. Specifically, Claims 1, 15-16, 23-24 and 35 were rejected under 35 USC 102(b) as being anticipated by USPN 5,585,974 to Shrinkle. Claims 14 and 34 were rejected under 35 USC 103(a) as being unpatentable over Shrinkle in view of by USPN 6,233,109 to Melbye.

Applicant would like to point out that replacement drawing sheets were submitted in response to the Office Action of August 27, 2004, and respectfully requests that in the next Office Action the Examiner acknowledge receipt and review of those replacement drawing sheets.

Rejection of claims under 35 USC 102(b)

Rejection of Claims 1, 15-16, 23-24 and 35 under 35 USC 102(b) as being anticipated by Shrinkle is respectfully traversed because, for at least the following reasons, Shrinkle does not disclose all of the claimed limitations.

Shrinkle is directed to a PRML read channel calibration scheme which reduces the time requirements for calibration. Specifically, Shrinkle provides a method of calibrating a read/write circuit to optimize operating parameters of complex circuits such as PRML channels used in the circuit. The operation of the read channel is marginalized by the introduction of noise into the read channel during the time of calibration. Accordingly, the performance of the read channel is purposely degraded during calibration, in a manner consistent with channel characteristics, to a marginal level of performance to dramatically increase the bit error rate (Shrinkle, col. 4, lines 3-

12). The calibration technique reduces the time requirements for calibration (Shrinkle, col. 4, lines 33-37).

By contract, the present invention is directed to a method of improving data playback error performance in data storage devices, as claimed herein. In one embodiment, the present invention provides a data *writing process* using dithering which causes multiple heads to essentially appear to perform the same way. During such a *write process*:

> data is written to the media, then read back while dithering is performed by injecting noise into the read-back signal;
> the error rate of the read data is determined;
> the read error rate is compared to a selected target error rate; and
> the write process is repeated if the read error rate is greater than the target error rate.

As such, the heads generate the same error rates across all heads in the tape drive. In one example, a target error rate is selected for one or more of the data storage devices. For each data storage device, a dither value is determined for each head in the data storage device. Wherein for each head, using the corresponding dither value for writing data, essentially provides said selected target error for all the heads.

Therefore, **as per Claim 1**, Shrinkle does not disclose: "selecting a target error rate for *recording* data during the *write process*, for one or more of the data storage devices," as required by Claim 1 (emphasis added). Further, Shrinkle does not disclose the steps of: "for each data storage device, determining a dither value for each head in the data storage device, wherein for each head, using the corresponding dither value for the write process essentially provides said selected target error for all the heads," as required by Claim 1.

By contrast, Shrinkle selects a noise level to accelerate calibration, not to improve readback error performance as claimed. In Shrinkle a channel noise level is selected in order to accelerate the rate of accumulating error statistics for use in the calibration operation. Further, Shrinkle does not select a dither value for use in a *write process* to improve data playback error

performance, as claimed herein. Rather, Shrinkle's calibration technique reduces the time requirements for calibration (Shrinkle, col. 4, lines 33-37).

Applicant has carefully studied Shrinkle, Abstract, Fig. 1 and col. 7, lines 7-17, relied on by the Examiner, and has not found the claimed limitations therein. In Fig. 1, Shrinkle shows a general disk drive schematic. In the Abstract section, Shrinkle essentially mentions a noise generator that introduces noise into a set of electronic components to cause the set of electronic components to operate at a marginal level of performance and thereby increase the error rate of the read channel. A calibration of the read channel is performed when the read channel is operating at the marginal level of performance to decrease the time required to accumulate error statistics used in the calibration. Further, in col. 6, line 64 to col. 7, line 17, Shrinkle only describes a conventional system by stating that:

> As known, the PRML channel implements PRML signal processing techniques to detect digital information from the electrical signals and typically includes components that are adjustable to vary the operating parameters of the read channel to optimize data detection for highly accurate data detection. Typically, the adjustments are made in a calibration operation wherein known test patterns comprising random bit sequences are written onto the disk surfaces, as described above.
>
> The disk drive is then operated to read back the test patterns, which pass through the PRML read channel 54. The bits output by the PRML channel 54 are compared, bit by bit, to the test patterns to provide bit detection error rates within the PRML read channel 54 with respect to each of the heads 24a-h of the disk drive. A comparator to perform the bit by bit comparison can be installed in the disk drive. Alternatively, an external comparator can be used. A user can then vary the parameters of the channel 54 after each read back and comparison of a test pattern, until the error rate for the pattern reaches a minimum value, usually set in the design specification for the disk drive product.

Clearly then, in col. 7, lines 6-17 (relied on by the Examiner), Shrinkle only discusses a calibration process wherein test patterns comprising random bits are written onto disk surfaces, and read back. The read-back test patterns are compared to the initial test pattern to determine error rates, whereby a user can vary the parameters of the read channel to achieve a minimum error value. There is no disclosure in Shrinkle (col. 7, lines 6-17, relied on by the Examiner) of a method of improving data playback error performance in data storage devices by: selecting a target error rate for recording data during a write process, and determining a dither value for each

head in the data storage device, wherein for each head, using the corresponding dither value for the write process essentially provides said selected target error for all the heads, as required by Claim 1.

Indeed, in col. 7, lines 18-22, Shrinkle that the read channel is marginalized during the calibration operation to purposely increase the error rate so that error statistics sufficient to support a reliable calibration process can be accumulated quickly. An adjustable Gaussian noise generator 56 is provided in the read/write control 36. An output of the noise generator 56 is coupled to a summing circuit 57 that operates to introduce the noise output of the generator 56 into the signals output by the AGC 50 (col. 7, lines 22-29). With the addition of the noise into the AGC signals, operation of the PRML channel 54 will degrade to a marginal condition, with a commensurate increase in the error rate. Accordingly, error statistics for use in the calibration operation can be accumulated at an accelerated rate (col. 7, lines 32-37).

Shrinkle is oblivious to improving data playback error performance by selecting a target error rate for recording data during a write process, and determining a dither value for each head in the data storage device, wherein for each head, using the corresponding dither value for the write process essentially provides said selected target error for all the heads, as claimed herein.

Shrinkle does not select a target error rate for recording data during a write process, as claimed. Rather, Shrinkle selects a noise level to approach marginal channel performance for a high error rate in order to accelerate the rate of accumulating error statistics for use in the calibration operation.

In Shrinkle, improving data playback error performance as claimed is not disclosed. Not only Shrinkle does not select a target error rate for recording data during a write process, but also Shrinkle does not determine a dither value for each head in the data storage device, wherein for each head, using the corresponding dither value for the *write process* essentially provides said selected target error for all the heads, as claimed herein.

By contrast, Shrinkle selects a noise level to accelerate calibration, not to improve readback error performance as claimed. In Shrinkle a channel noise level is selected in order to accelerate the rate of accumulating error statistics for use in the calibration operation. Shrinkle does not select a target error rate and dither value for use in a *write process* to improve data playback error performance, as claimed herein. Shrinkle's calibration technique reduces the time requirements for calibration (Shrinkle, col. 4, lines 33-37). For at lease these reasons, rejection of Claim 1 should be withdrawn.

Claims 15 and 16 were rejected for the same reasons as Claim 1, and should therefore be allowed for at least the reasons provided above in relation to Claim 1.

Claims 23 and 24 were rejected for the same reasons as Claim 1, and should therefore be allowed for at least the reasons provided above in relation to Claim 1.

Claim 35 was rejected for the same reasons as Claim 1, and should therefore be allowed for at least the reasons provided above in relation to Claim 1.

<u>Rejection of Claims under 35 USC 103(a)</u>

Rejection of Claims 14 and 34 under 35 USC 103(a) as being unpatentable over Shrinkle in view of Melbye is respectfully traversed because the references, alone or in combination, do not disclose all of the claimed limitations.

As discussed, Shrinkle does not disclose all of the limitations of independent Claims 1 and 23, from which Claims 14 and 34 depend. Further, as the Examiner also states, Shrinkle does not disclose all of the limitations of Claims 14 and 34. However, **as per Claim 14**, the Examiner states Melbye discloses a tape drive including multiple transducer heads, and the recording media comprises magnetic tapes, and that the references can be combined to yield the claimed limitations.

It is well settled that in order for a modification or combination of the prior art to be valid, the prior art itself must suggest the modification or combination, "...invention cannot be

found obvious unless there was some *explicit* teaching or suggestion in the art to motivate one of ordinary skill to combine elements so as to create the same invention." *Winner International Royalty Corp. v. Wang*, No. 96-2107, 48 USPQ.2d 1139, 1140 (D.C.D.C. 1998) (emphasis added). "The prior *art must provide* one of ordinary skill in the art the *motivation* to make the proposed molecular modifications needed to arrive at the claimed compound." *In re Jones*, 958 F.2d 347, 21 USPQ.2d 1941, 1944 (Fed. Cir. 1992) (emphasis added). Neither reference suggests the motivation to modify or combine them as proposed by the Examiner. The references are individually complete and functionally independent for their limited specific purposes and there would be no reason to make the modification proposed by the Examiner. Therefore, because neither of the prior art references suggests the combination and modifications proposed by the Examiner the combination and modifications are improper.

Melbye and the present invention are fundamentally different. The present invention discloses a write process which includes dithering a read-back signal during the write process, for reliable data storage and recovery. By contrast, Melbye is directed to a data reading process, wherein a transducer head reads a desired data track by creating lateral differential motion of the head assembly with respect to the longitudinally extending data tracks of a magnetic tape.

Further, Shrinkle is directed to calibration of a disk drive, and there is no suggestion or mention in Shrinkle that its teachings can be applied to a tape drive as suggested by the Examiner. In addition, Melbye and Shrinkle are fundamentally different. Melbye discloses a read process by mechanically wobbling a read head while reading data to improve read performance. Whereas, Shrinkle discloses purposely degrading a disk drive read channel to reduce the time requirements for calibration. There is no suggestion or motivation in either reference to combine them. Even if the references can be legally combined, the result does not provide a method of improving data playback error performance in a tape drive by selecting a target error rate for recording data during the write process, and determining a dither value for each head in the tape drive, wherein for each head, using the corresponding dither value for the write process essentially provides said selected target error for all the heads. For at least these reasons, rejection of Claim 14 should be withdrawn.

Claim 34 was rejected for the same reasons as Claim 14, and should therefore be allowed for at least the reasons provided above in relation to Claim 14.

Conclusion

Applicant believes that the application appears to be in condition for allowance. Accordingly, reconsideration and allowance thereof is respectfully requested.

Please address all future correspondence to agent of record.

Respectfully submitted,

Michael Zarrabian
Registration No. 39,886
Authorized representative
Tel. (310) 201-0640

Date: July, 11 2005

CERTIFICATE OF MAILING

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450 ON THIS 11th DAY OF July, 2005.

Michael Zarrabian